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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
DASTOURI, MEHRDAD	
ART UNIT	**PAPER NUMBER**
2623	

DATE MAILED: 01/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/476,684	AVINASH, GOPAL	
	Examiner	Art Unit	
	Mehrdad Dastouri	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 July 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-39* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's remarks filed July 26, 2004, has been entered and made of record.

Specification

2. Objection to the disclosure has been withdrawn in view of Applicant's amendment.

Drawings

3. Objection to drawings has been withdrawn in view of Applicant's amendment. However, applicant should provide replacement drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to this Office action. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures.

Applicant is given a TWO MONTH time period to submit new drawings in compliance with 37 CFR 1.81. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a). Failure to timely submit replacement drawing sheets will result in ABANDONMENT of the application.

4. Applicant's arguments filed July 26, 2004, have been fully considered but they are not persuasive.

Applicant argues in essence that prior art of record (Li et al.) is not directed to "identifying structural features of the smoothed images", (Applicant's remarks, Page 15, first paragraph); "orientation smoothing of the structural features" and homogenization

smoothing of non-structural regions of the image", (Applicant's remarks, Page 15, second paragraph).

Li et al. clearly disclose claimed limitations in a plurality of recitations (Prior arts' entire teachings should be considered) including passages referred to by the Examiner.

The prior art methodology encompasses the broad claimed limitations, and performs smoothing image data representative of pixels of a reconstructed image (Column 5, Lines 64-66. Low-pass filtering is the well-known methodology routinely utilized in image processing for smoothing images.), identifying structured features from the smoothed image data (Column 6, Lines 1-6), orientation smoothing of the structural features of the image (Column 6, Lines 13-27 which is the detailed explanation of filtering disclosed in Column 5, Lines 64-66), and homogenization smoothing non-structural regions (Column 6, Lines 3-6).

Li et al. further disclose orientation sharpening the structural features as depicted in Figures 3-6 and disclosed in Column 9, Lines 64-67, Column 10, Lines 1-66. High-pass filtering is the well-known methodology routinely utilized in image processing for sharpening edges (i.e., structural features).

Figure 2 depicts dominant orientation smoothing is performed based upon a predetermined relationship between a characteristic of each structural pixel in the dominant orientation and in the orthogonal orientation recited in Claim 22.

It is further submitted that although prior art of record disclose claim limitations based on the written sequence of the limitations, Claims 1, 9, 16, 22 and 30, do not explicitly and necessarily recite a preceding or succeeding order for these limitations.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 2, 4-8, 22-24, 26-29, 30-33 and 35-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (U.S. 5,602,934) in view of Noll et al (Homodyne Detection in Magnetic Resonance Imaging; IEEE Paper ISBN: 0278-0062).

Regarding Claim 1, Li et al disclose a method for enhancing a discrete pixel image, the method comprising the steps of:

(a) smoothing image data representative of pixels of a reconstructed image (Figures 1 and 2; Equations 1-12; Column 5, Lines 64-67, Column 5, Lines 1-47; Column 7, Lines 4-13);

(b) identifying structural features from the smoothed image data (Figures 1 and 2; Column 7, Lines 4-67, Column 8, Lines 1-57);

(c) orientation smoothing the structural features (Figures 1 and 2; Column 5, Lines 64-67, Column 5, Lines 1-47);

(d) homogenization smoothing non-structural regions (Figures 1 and 2; Column 6, Lines 12-47; Column 7, Lines 4-67, Column 8, Lines 1-57);

(e) orientation sharpening the structural features (Figure 4; Equations 13-21; Column 10, Lines 2-67, Column 11, Lines 1-50);

(f) blending the image data into data processed in accordance with the foregoing steps (Figure 5, Steps 510, 516 and 518; Figure 6; Column 11, Lines 66-67; Column 12, Lines 1-10).

Li et al do not explicitly disclose blending texture from the image data into the processed data.

Blending texture from the image data into the processed data is well known as taught by Noll et al based on homodyne detection in MRI (Teachings of IEEE Paper ISBN: 0278-0062 dated June 1991, Sections II and III, in particular "Partial k-Space).

Noll et al disclose blending texture from the image data into the processed data of the image in MRI reconstruction (Section III, APPLICATIONS).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Li et al invention according to the teachings of Noll et al to blend texture from the image data into the data processed in accordance with the steps (a) through (e) because it will enhance MRI images and will reconstruct the image by including missing image information.

Regarding Claim 2, Li et al further disclose the method of Claim 1, wherein the structural features are determined based upon a scaled threshold value (Column 13, Lines 9-40; Column 15, Lines 34-40).

Regarding Claim 4, Li et al further disclose the method of Claim 1, wherein in step (b) the structural features include pixels having values below a first threshold value but above a second, lower threshold value, and positioned adjacent to a structural pixel (Column 15, Lines 34-40).

Regarding Claim 5, Li et al further disclose the method of Claim 1, wherein step (c) includes dominant orientation smoothing pixels based upon a dominant orientation and an orientation orthogonal to the dominant orientation (Figures 2 and 3; Column 6, Lines 12-47).

Regarding Claim 6, Li et al further disclose the method of Claim 5, wherein dominant orientation smoothing is performed based upon a predetermined relationship between a characteristic of each structural pixel in the dominant orientation and in the orthogonal orientation (Figures 2 and 3; Column 6, Lines 12-47).

Regarding Claim 7, Li et al further disclose the method of Claim 6, wherein the characteristic is a number of counts of orientations within a neighborhood of each structural pixel (Column 7, Lines 4-36).

Regarding Claim 8, Li et al further disclose the method of Claim 1, wherein step (e) is performed only for structural pixels having a value above a desired lower limit value (Column 14, Lines 10-43).

With regards to Claims 22 and 23, arguments analogous to those presented for Claims 1 and 5 are applicable to Claims 22 and 23.

With regards to Claim 24, arguments analogous to those presented for Claim 2 are applicable to Claim 24.

With regards to Claim 26, arguments analogous to those presented for Claim 4 are applicable to Claim 26.

With regards to Claim 27, arguments analogous to those presented for Claim 6 are applicable to Claim 27.

With regards to Claim 28, arguments analogous to those presented for Claim 7 are applicable to Claim 28.

Regarding Claim 29, Li et al further disclose the method of Claim 1, wherein step (d) is performed only for structural pixels having a value above a desired lower limit value (Column 13, Lines 33-54).

With regards to Claims 30-32, arguments analogous to those presented for Claim 1 are applicable to Claims 30-32. Li et al further disclose the image acquisition system includes a magnetic resonance scanner (Figure 1; Column 5, Lines 10-47).

With regards to Claim 33, arguments analogous to those presented for Claim 2 are applicable to Claim 33.

With regards to Claim 35, arguments analogous to those presented for Claim 4 are applicable to Claim 35.

With regards to Claim 36, arguments analogous to those presented for Claim 5 are applicable to Claim 36.

With regards to Claim 37, arguments analogous to those presented for Claim 6 are applicable to Claim 37.

With regards to Claim 38, arguments analogous to those presented for Claim 7 are applicable to Claim 38.

With regards to Claim 39, arguments analogous to those presented for Claim 8 are applicable to Claim 39.

7. Claims 3, 9-21, 25 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (U.S. 5,602,934) further in view of Noll et al (Homodyne

Detection in Magnetic Resonance Imaging; IEEE Paper ISBN: 0278-0062) and Felmlee et al (U.S. 5,900,732).

Regarding Claim 3, Li et al disclose the method of Claim 2, wherein the scaled threshold value is computed based upon an initial threshold value (Column 13, Lines 9-40; Column 14, Lines 10-43; Column 15, Lines 34-40. Threshold function with lower cut off side value 0.9r and higher cut off value 1r.).

Li et al and Noll et al do not explicitly disclose the scaling factor is input by a user.

Felmlee et al disclose a system of reconstructing MR images comprising manually setting thresholds and scale factors (Column 4, Lines 5-9).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Li et al and Noll et al combination according to the teachings of Felmlee et al to apply a scaled threshold value input by a user because it will increase system flexibility and will result in enhancing extraction of the structural features.

With regards to Claims 9 and 10, arguments analogous to those presented for Claims 1-3 are applicable to Claims 9 and 10.

With regards to Claim 11, arguments analogous to those presented for Claim 4 are applicable to Claim 11.

With regards to Claim 12, arguments analogous to those presented for Claim 5 are applicable to Claim 12.

With regards to Claim 13, arguments analogous to those presented for Claim 6 are applicable to Claim 13.

With regards to Claim 14, arguments analogous to those presented for Claim 7 are applicable to Claim 14.

With regards to Claim 15, arguments analogous to those presented for Claim 8 are applicable to Claim 15.

With regards to Claims 16 and 17, arguments analogous to those presented for Claims 1-4 are applicable to Claims 16 and 17.

With regards to Claim 18, arguments analogous to those presented for Claim 5 are applicable to Claim 18.

With regards to Claim 19, arguments analogous to those presented for Claim 6 are applicable to Claim 19.

With regards to Claim 20, arguments analogous to those presented for Claim 7 are applicable to Claim 20.

With regards to Claim 21, arguments analogous to those presented for Claim 8 are applicable to Claim 21.

With regards to Claims 25 and 34, arguments analogous to those presented for Claim 3 are applicable to Claim 25 and 34.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mehrdad Dastouri whose telephone number is (703) 305-2438. The examiner can normally be reached on Monday to Friday from 8:00 a.m. to 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MEHRDAD DASTOURI
PRIMARY EXAMINER

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Group Art Unit 2623
January 5, 2005